Relative Permanent Income and Consumption: A Synthesis of Keynes, Duesenberry, Friedman, and Modigliani and Brumbergh

Abstract

This paper presents a theoretical model of consumption behavior that synthesizes the seminal contributions of Keynes (1936), Friedman (1956), Duesenberry (1948), and Modigliani and Brumbergh (1955). The model is labeled a "relative permanent income" theory of consumption. The key feature is that the share of permanent income devoted to consumption is a negative function of household relative permanent income. The model generates patterns of consumption spending consistent with both long-run time series data and moment in time cross-section data. It also explains why consumption inequality is less than income inequality.

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I Overview

This paper provides a theoretical model of consumption that synthesizes the seminal contributions of Keynes (1936), Friedman (1956), Duesenberry (1948), and Modigliani and Brumbergh (1955). The model that is developed is labeled a "relative permanent income (RPI)" theory of consumption. The model is intuitive and tractable, and with all the major established empirical facts of consumption.

The structure of the paper is as follows. Section II provides a brief comparison of the theories of consumption developed by Keynes, Friedman, and Modigliani and Brumbergh. Section III presents the RPI model that synthesizes Keynes, Friedman and Duesenberry. Section IV discusses the consistency of the model with the known empirical facts on consumption. Section V extends the model to a utility theoretic framework. Section VI concludes the paper with some speculations as to why later work on consumption ignored Duesenberry's ideas.

II A brief history of modern consumption theory

Modern consumption theory begins with Keynes (1936) analysis of the psychological foundation of consumption behavior in his *General Theory*.

> "The fundamental psychological law, upon which we are entitled to depend with great confidence both *a priori* and from our knowledge of human nature and from the detailed facts of experience, is that men are disposed, as a rule and on the average, to increase their consumption, as their income increases, but not by as much as the increase in their income (The General Theory, 1936, p.96)"

The main well-known features of Keynes' analysis are that the marginal propensity to consume (MPC) falls with income, as does the average propensity to consume (APC). From a policy standpoint, this implies that redistributing income from high to low income

households raises aggregate consumption since low-income households have a higher MPC.

In the wake of the publication of *The General Theory* Keynes' theory of aggregate consumption spending was quickly adopted, but it was soon confronted by an empirical puzzle. Using five year moving averages of consumption spending, Kuznets (1946) showed that long run time series consumption data for the U.S. economy are characterized by a constant aggregate APC, a finding that is inconsistent with Keynesian consumption theory. At the same time, short sample aggregate consumption time series estimates and cross-section individual household consumption regression estimates both confirm Keynes' theory of a diminishing APC.[1]

In response to this empirical puzzle, Milton Friedman (1956) proposed his permanent income hypothesis (PIH) which maintains that households spend a fixed fraction of their permanent income on consumption. Permanent income is defined as the annuity value of lifetime income and wealth. The PIH gives rise to a consumption function of the form:

(1) $C_t = cY^*_t$

where C = consumption spending, c = MPC, and Y^* = permanent income. According to PI theory the MPC is constant and equal to the APC, which is consistent with Kuznets'(1946) empirical findings. The MPC is also the same for all households. PI theory reconciles the difference between cross-section regression estimates of

[1] Keynes' theory of consumption behavior initially appeared to be borne out by linear estimates of the consumption function using short period data. Thus, on the basis of annual U.S. data for the period 1929 - 1941, Ackley (1960, p.225) reported an estimated consumption function of $C_t = 26.6 + 0.75Y_t$ where C = aggregate consumption spending and Y = aggregate disposable income. However, using over-lapping decade averages of consumption and GDP, Kuznets (1946) showed that except for the Depression years, the APC in the U.S. over the period 1869 - 1938 fluctuated narrowly between 0.84 and 0.89.

consumption and long run aggregate time series regression estimates by appeal to an "errors-in-variables" argument. The argument is that cross section estimates use actual household income rather than permanent household income. Owing to the fact that more households are situated in the middle of the income distribution, the observed distribution of actual household income (which equals permanent income plus transitory shocks) tends to be more spread out than permanent income. Consequently, regression estimates using actual income tend to find a flatter slope, and hence the finding that cross section consumption function estimates are flatter than time series aggregate per capita consumption function estimates.

Friedman's PIH offered a simple explanation of the empirical consumption puzzle. At the theoretical level, its construct of permanent income introduced income expectations, thereby adding a sensible forward-looking dimension to consumption theory. Finally, the theory had important implications for fiscal policy. First, since all households have the same MPC it undermined the Keynesian demand stimulus argument for progressive taxation. Second, it introduces a distinction between permanent and temporary tax cuts, with only the former having a significant impact on consumption since only permanent tax cuts significantly change permanent income.

At the same time that Friedman was developing his PI theory of consumption, Modigliani and Brumberg (1955) were developing their lifecycle model. According to lifecycle theory individuals choose a lifetime pattern of consumption that maximizes their lifetime utility subject to their lifetime budget constraint. The lifecycle approach makes a number of important contributions. First, it introduces utility maximization, thereby introducing agency into consumption theory. This treatment reconciled macroeconomic

consumption theory with microeconomic choice theory. Second, lifecycle consumption theory is also forward looking since it includes lifetime income expectations in the lifetime budget constraint. Third, the constrained utility maximization framework introduces credit markets and borrowing and lending. Fourth, this also introduces the effects of interest rates and time preference on consumption. Fifth, lifecycle theory incorporates a sociological dimension, explicitly recognizing that consumption expenditures may vary by stage of life. At the empirical level this is confirmed by evidence that population age distribution affects aggregate consumption (Fair and Dominguez, 1991).

In many regards Modigliani and Brumbergh's lifecycle model can be viewed as a compromise between the theories of Keynes and Friedman. Thus, the lifecycle approach generates a permanent income consumption function if (i) the borrowing rate, lending rate, and rate of time preference all equal zero, and (ii) there are no constraints on borrowing. Second, if households are liquidity-constrained (credit constrained), their MPC is unity. The reason is that credit constrained households would like to borrow to finance additional consumption but they cannot. Consequently, they view all additional income as relaxing this constraint and spend it. Since constrained households often tend to be low-income households who have a higher MPC, this lends a Keynesian quality to the lifecycle model. Third, like the PIH model, the lifecycle model predicts a smaller impact of tax cuts than the Keynesian consumption function since tax cuts are smoothed and spent over an individual's entire remaining lifespan. However, this impact of tax cuts can be large for liquidity constrained households whose MPC is unity.

III A relative permanent income (RPI) model

The permanent income and lifecycle hypotheses have dominated consumption theory for the last fifty years. Another theory that was initially viewed with promise but then lost traction was Duesenberry's (1948) relative income theory of consumption. Duesenberry's theory maintains that consumption decisions are motivated by "relative" consumption concerns – "keeping up with the Joneses."

> "The strength of any individual's desire to increase his consumption expenditure is a function of the ratio of his expenditure to some weighted average of the expenditures of others with whom he comes into contact."

A second claim is that consumption patterns are subject to habit and are slow to fall in face of income reductions

> "The fundamental psychological postulate underlying our argument is that it is harder for a family to reduce its expenditure from a higher level than for a family to refrain from making high expenditures in the first place (Duesenberry, 1948)."

Duesenberry's theory can be amended and restated to generate a Keynes – Friedman – Duesenberry relative permanent income (RPI) theory of consumption. This can be done by amending Keynes' fundamental law as follows (bold italics added):

> "The fundamental psychological law, upon which we are entitled to depend with great confidence both *a priori* and from our knowledge of human nature and from the detailed facts of experience, is that men are disposed, as a rule and on the average, to increase their consumption as their ***permanent*** income increases. ***The share that they spend out of their permanent income depends on their relative permanent income, and the greater their relative income the smaller that share.***"

The key innovation is making household consumption decisions depend on relative permanent income.

An RPI theory of consumption can be represented with the following simple model consisting of two types of households, and in which there is no income uncertainty

so that actual income equals permanent income. Individual household consumption spending is governed by:

(2) $C_{i,t} = c(Y_{i,t}/Y_t)Y_{i,t}$ $\qquad 0 < c(.) < 1,\ c' < 0,\ c'' \gtrless 0$

where $C_{i,t}$ = consumption of household i in period t, $Y_{i,t}$ = disposable PI of household i in period t, and Y_t = average disposable PI in period t. Equation (2) is household i's consumption function and is similar to the standard PI consumption function described earlier by equation (1). However, now the MPC depends on a household's disposable permanent income relative to average disposable permanent income. The restated fundamental psychological law implies that $dC_{i,t}/dY_{i,t} = c(Y_{i,t}/Y_t) + c'(Y_{i,t}/Y_t)\ Y_{i,t}\ /Y_t > 0$. Household consumption increases with increases in household income, but the increase is mitigated if the increase in household income raises a household's relative income position. This is because households' MPC fall as RPI rises. Microeconomics distinguishes between "income" and "substitution" effects. RPI theory introduces a distinction between "absolute" and "relative" income effects.

Figures 1.a and 1.b show household MPC as a function of RPI. In Figure 1.a the MPC is drawn as a quasi-concave function so that the MPC falls rapidly for some range as RPI rises. In Figure 1.b the MPC is drawn as a convex function so that the decline in MPC tapers off as RPI rises. The shape of the MPC function has important consequences with regard to the impact of income distribution on aggregate consumption. This can be seen readily by considering the case of an economy with two types of household, one with low income and the other with high income. In this case the economy-wide average MPC is the weighted average of the individual household MPCs. In terms of Figures 2.a and 2.b it is a point along a chord connecting the individual household MPCs. The

distance between the economy-wide weighted average MPC and the individual household MPC is inversely proportional to the weight given to each household type. Now, consider an increase in income inequality for the case of a strictly concave MPC. This increases the relative income of the high-income household, decreases the relative income of the low-income household, and widens the gap between the MPCs of the households. As a result the chord joining the two households shifts toward the origin, and the average MPC falls. This will tend to lower aggregate consumption, so that widened income inequality is bad for consumption. Conversely, if the MPC is a convex function, widening income inequality will tend to raise the average MPC so that the net impact of the redistribution is mitigated.

The economic logic for these impacts is easily understood in terms of absolute and relative income effects. The redistribution of income lowers the absolute income of low-income households and increases that of high-income households. Since low-income households have a higher MPC, this lowers aggregate consumption spending. However, the shift also lowers the relative income of low-income households, which increases their MPC and positively impacts aggregate consumption. Conversely, it raises the relative income of high-income households, which lowers their MPC and lowers aggregate spending. If the "keeping up with he Joneses" effect (the relative income effect) is very strong among low-income households (i.e. the MPC is convex), then it will reduce the negative effects on consumption from redistributing income from low- to high-income households. Indeed, it is theoretically possible that the net effect could even be positive if the net relative income effect dominates the net absolute income effect.

The above household model of consumption can be incorporated in a model of aggregate consumption as follows. There are two types of household, and their consumption spending is described by:

(3) $C_{i,t} = c(Y_{i,t}/Y_t)Y_{i,t}$ $\quad i = 1,2$

Relative income is given by

(4) $Y_{1,t} = aY_{2,t}$ $\quad 0 < a < 1$

where a = relative income parameter. Since $a < 1$, this implies type 1 households are low income households. The distribution of aggregate income across household types is given by:

(5) $Y_t = qY_{1,t} + [1 - q]Y_{2,t}$ $\quad 0 < q < 1$

$= qaY_{2,t} + [1 - q]Y_{2,t}$

where q = household composition parameter, and Y_t = exogenous average income. Aggregate per capita consumption is a weighted average of household consumption and given by:

(6) $C_t = qc(Y_{1,t}/Y_t)Y_{1,t} + [1-q]\, c(Y_{2,t}/Y_t)Y_{2,t}$

Substitution of equations (3), (4) and (5) into equation (6) then yields the following reduced form expression for the aggregate consumption function.

(7) $C_t = qc(a/[1+qa-q])aY_t/[1+qa-q] + [1-q]\, c(1/[1+qa-q])Y_t/[1+qa-q]$

Disequilibrium lag and habit ratchet effects, which are the second part of Duesenberry's theory can be readily incorporated through the following lagged adjustment mechanism:

(8) $C_{i,t} - C_{i,t-1} = k_1[C^*_{i,t} - C_{i,t-1}] + k_2D[C^*_{i,t} - C_{i,t-1}]$

where C = actual consumption, C^* = desired consumption = $c(Y_{i,t}/Y_t)Y_{i,t}$, k_1 and k_2 = adjustment coefficients, and D = indicator variable that 0 if $dY > 0$ and 1 if $dY < 0$. The theoretical rational for such lagged adjustment effects is that there are psychic costs to adjusting consumption, and these psychic costs are asymmetric and larger for downward adjustments.

Figure 2 shows the individual household PRI consumption functions described by equation (3) in the model. Figure 3 shows the effect of worsened distribution of income ($a_1 < a_0$) on the individual household consumption functions. The low-income household's consumption function rotates counter-clockwise reflecting the impact of lower RPI, while the high-income household's consumption function rotates clockwise.

There are two exercises to be considered. Exercise one is to derive the aggregate consumption function consistent and then examine its properties. Exercise two is to derive the cross-section household consumption function and then examine its properties.

The aggregate per capita RPI consumption function is a weighted average of the individual household RPI consumption functions and given by

(9) $C_t = \{qc(a/[1+qa-q]) + [1-q]\, c(1/[1+qa-q])\}[1+a]Y_t/[1+qa-q]$

This aggregate consumption function is illustrated in Figure 4. The aggregate consumption function is a positive function of weighted average household income. Assuming the distribution of income and the distribution of household types remains unchanged, aggregate consumption will move along the aggregate consumption function over time as income grows. The aggregate MPC (i.e. slope of the aggregate consumption function) is given by

$dC_t/dY_t = \{qc(a/[1+qa-q]) + [1-q]\, c(1/[1+qa-q])\}[1 + a]/[1+qa-q]$

The aggregate MPC is therefore constant and independent of the level of income, a feature that is consistent with Kuznets' (1946) empirical findings. Inspection of the expression for the MPC also shows that it is affected by the distribution of income (a) and the composition of households (q), though the signs are theoretically ambiguous owing to conflicting absolute and relative income effects

Exercise two concerns the derivation of the cross-section household consumption function. This derivation is illustrated in Figure 5. At any moment in time households are consuming on their RPI consumption functions. The cross-section consumption function corresponds to the linear function obtained by connecting the household consumption - income points as shown in Figure 5. Simple linear algebra yields a slope and intercept for the cross-section consumption function given by:

$$\text{Slope} = m = [C_{2,t} - C_{1,t}]/[Y_{2,t} - Y_{1,t}] = [c(1/[1+qa-q]) - c(a/[1+qa-q])a]/[1-a]$$

$$\text{Intercept} = b = [c(1/[1+qa-q])-c(a/[1+qa-q])]aY_{2,t}/[1-a]$$

The slope and intercept terms are both functions of household income distribution (a) and the composition of households types (q). The intercept is a positive function of the level of income, and the cross-section consumption function therefore shifts up over time as income rises. This shifting process is illustrated in Figure 6.

IV Evidence on Consumption Behavior

The above RPI theory of consumption is consistent with all the known stylized facts about consumption. First, the theory generates a pattern of aggregate consumption that is consistent with Kuznets' (1946) finding of a relatively constant long-run APC. Second, the theory predicts that higher income households will have a higher average propensity to save and a lower APC. This finding has been empirically documented by Carroll

(2000), Dynan, Skinner & Zeldes (1996), and Lillard and Karoly (1997). Lastly, the theory predicts that the distribution of consumption will be more equal than the distribution of income owing to the "keeping up with the Joneses" effect that has lower relative income households spending proportionately more of their income. This prediction has been empirically confirmed by Krueger and Perri (2002). The proposed RPI theory is consistent with all of these empirical phenomena: other theories are not

V Interpreting the RPI Hypothesis in Terms of Utility Maximization

The above RPI model of consumption behavior can also be incorporated in a utility maximization framework that in turn links it with Modigliani and Brumbergh's (1955) lifecycle approach. The proposed RPI consumption function can be interpreted as the "stylized" solution of a household lifetime utility maximization program given by:

$$\text{(10) } \underset{c_{i,t}}{\text{Max}} \sum_{t=0}^{\infty} U(c_{i,t}, c_{i,t}/c_t, w_{i,t}/w_{,t})/[1+d]^t \qquad U_1 > 0, U_2 > 0, U_3 > 0$$

$$\text{Subject to (10.a) } \Sigma y_{i,t}/[1+r_t]^t + w_{i,0} = \Sigma c_{i,t}/[1+r_t]^t$$

$$\text{(10.b) } w_{i,t} = w_{i,t-1} + y_{i,t} - c_{i,t}$$

where $w_{i,t}$ = household i wealth in period t, d = household rate of time preference, and r_t = real interest rate in period t. Household i maximizes its discounted stream of lifetime utility by choice of a consumption plan subject to a lifetime budget constraint and a period wealth constraint. The particular representation given by equation (10) describes the household as having an infinite horizon. Alternative specifications could have a finite horizon with a bequest motive or with inter-generational altruism whereby the utility of future generations is nested as an argument in the current generation's utility function.

The key innovations are the specification of the utility function to include relative consumption and relative wealth as arguments. The inclusion of relative consumption captures the "keeping up with the Joneses" effect, while the inclusion of relative wealth represents the accumulation motive (Palley, 1993) that captures the desire for power. Consumption is a normal good so that the absolute level of consumption increases with income. Relative consumption is an inferior good so that relative consumption decreases with income. Thus, the rich have a higher absolute level of consumption than the poor, but their relative consumption level declines. Finally, relative wealth is a luxury good (income elasticity > 1) so that the accumulation of wealth increases strongly with income. The implication of such a specification is that as a household moves up the relative income ladder the absolute level of consumption spending increases, but the marginal propensity to save also increases in order to satisfy the accumulation motive.

In principle, given the above specification of the individual household utility maximization program it is then possible to derive an aggregate consumption function that has demographic dimensions as is done in the standard life-cycle model. Debt and liquidity constraints can also be incorporated by appropriately modifying the wealth constraint given by equation (10.b).

Such an RPI model adds additional psychological richness to the theory of consumption. The inclusion of relative consumption and wealth as arguments of the utility function helps explain why publicly reported happiness levels do not appear to have risen much over the last three decades despite large increases in household income (Blanchflower and Oswald, 2000; Layard, 2005) That utility is inter-dependent should not be a surprise. Love, altruism, envy, jealousy, power, and status are all sources of

utility, and all have elements of inter-dependence. The above specification incorporates status and power concerns in the utility function. At the policy level, the fact that lower income households have a higher MPC and lower MPS lends the model a traditional Keynesian tilt. Additionally, the model opens the possibility of aggregate under-consumption outcomes driven by widening income inequality, as described within the classical economic tradition (Mummery and Hobson, 1956; Rodbertus, 1949).

VI Conclusion: why was Duesenberry's relative consumption approach bypassed?

By way of closing it is worth speculating as to why Duesenberry's relative consumption approach was by-passed in later work on consumption theory. One answer is that capturing it requires adding arguments to the utility function, something that has often been resisted on the suspect grounds that this constitutes "ad hoc" theory.[2] A second possibility is that the no simple graphical representation of Duesenberry's model suitable for classroom presentation was ever developed.[3] A third possibility is that Duesenberry's ideas were resisted because utility inter-dependence is highly destructive of neo-classical welfare economics. In effect, it hollows out the concept of Pareto optimality, which is already fairly narrow. If relative consumption and wealth matter for individual's utility, then it is very hard to make all better off since raising the income of one while leaving the incomes of others unchanged is not Pareto improving. A final possibility is that Duesenberry's ideas were by-passed because of the chilling effects of the politics of the Cold War. Communist societies emphasized egalitarian concerns, and

[2] There is now growing realization that modifying the utility function is essential for explaining economic behaviors associated with such phenomena as effort, fairness, and identity.

[3] In comments made at a conference at which this paper was presented Robert Solow suggested that Duesenberry's model may have been bypassed for the most trite of reasons, namely that it failed to generate interesting exam questions for students.

this may have provoked resistance to incorporating relative well-being arguments in neo-classical economics.

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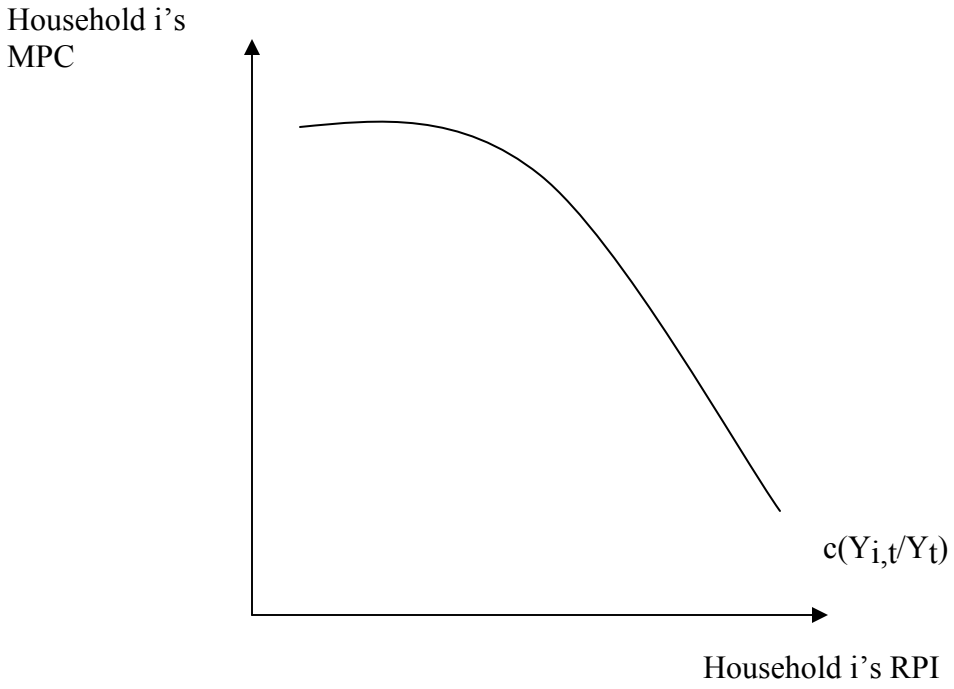

Figure 1.a. Household MPC as a concave function of RPI.

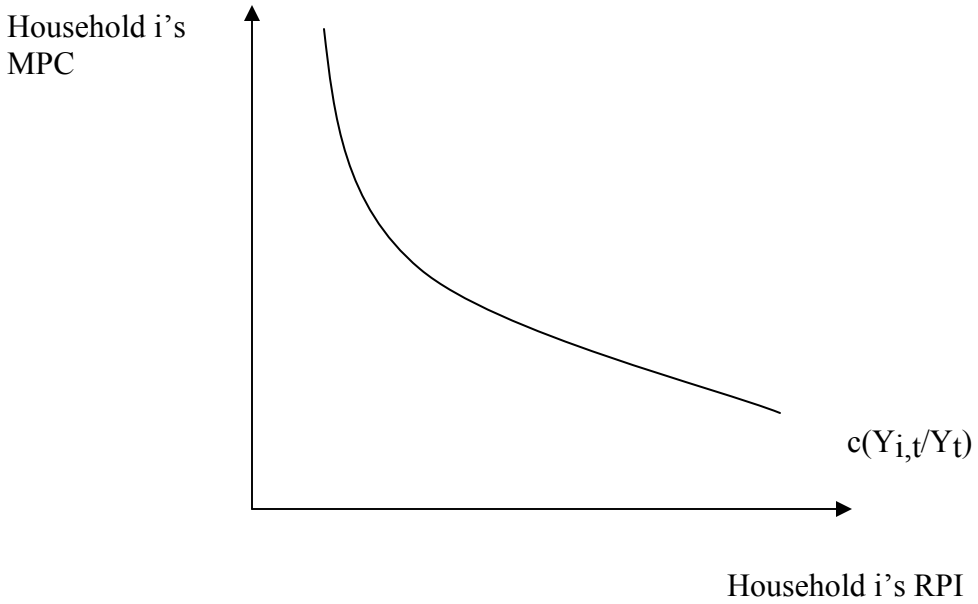

Figure 1.b. Household MPC as a convex function of RPI.

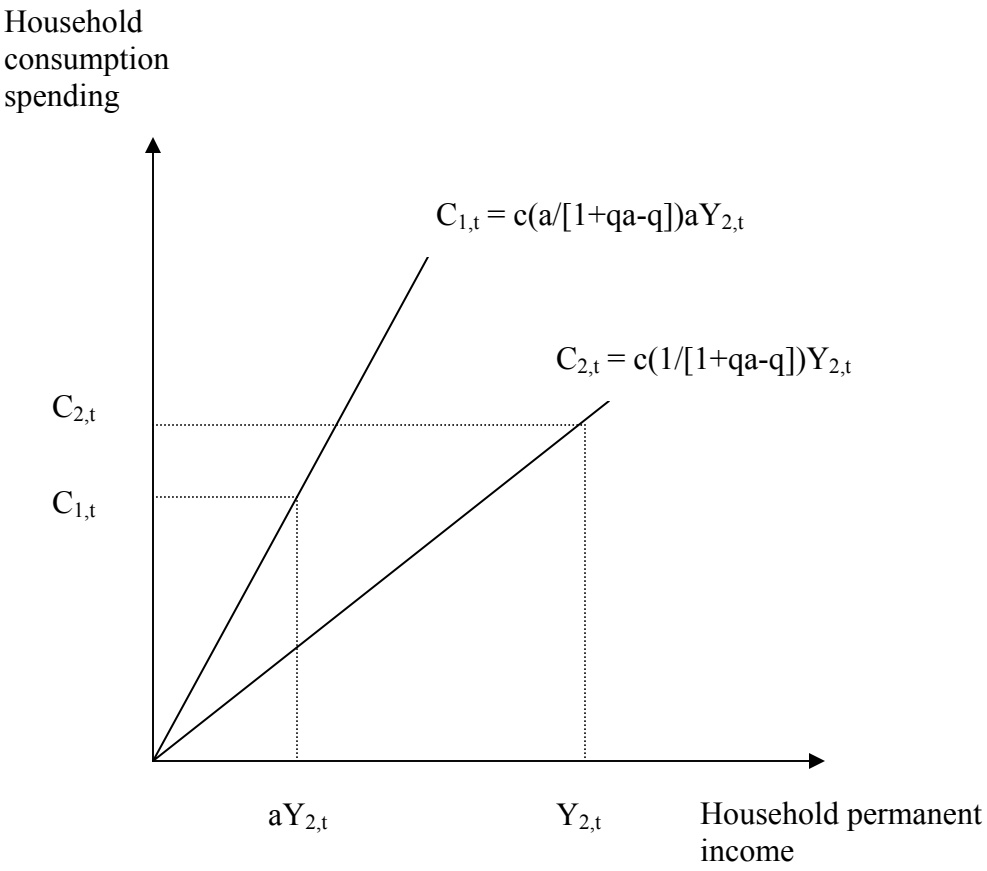

Figure 2. Individual household PRI consumption functions.

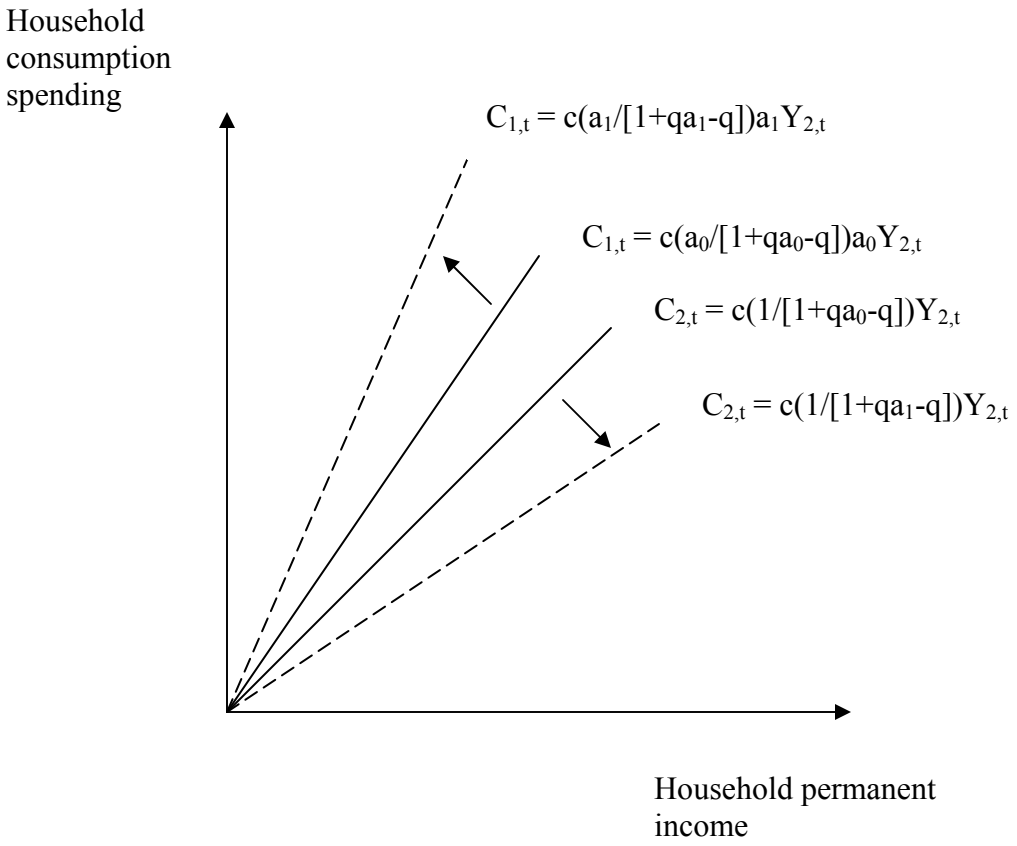

Figure 3. Effect of increased income inequality ($a_1 < a_0$) on individual household PRI consumption functions.

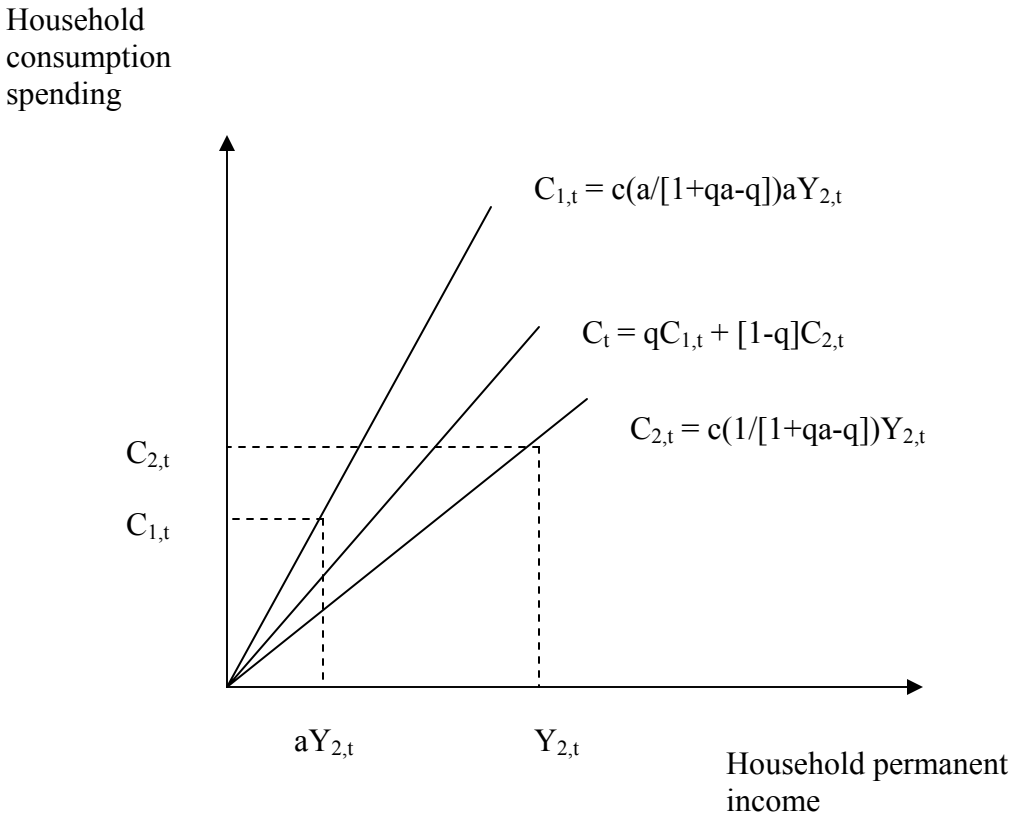

Figure 4. The aggregate consumption function derived as a weighted average of the individual household PRI consumption functions.

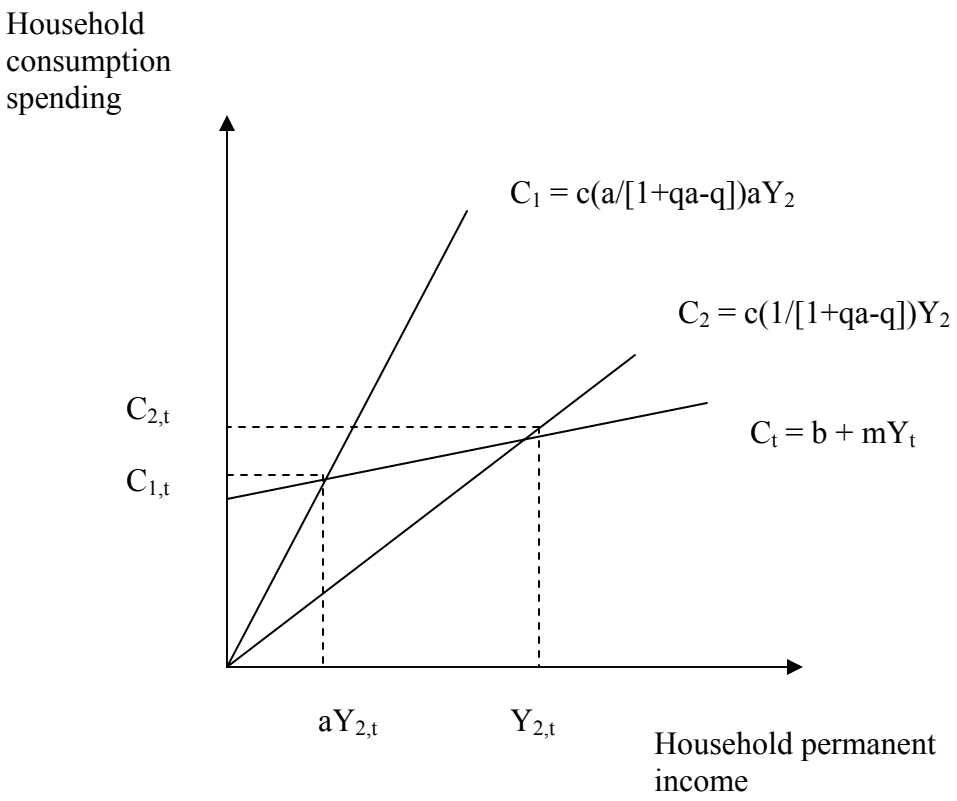

Figure 5. The cross-section consumption function in the PRI model.

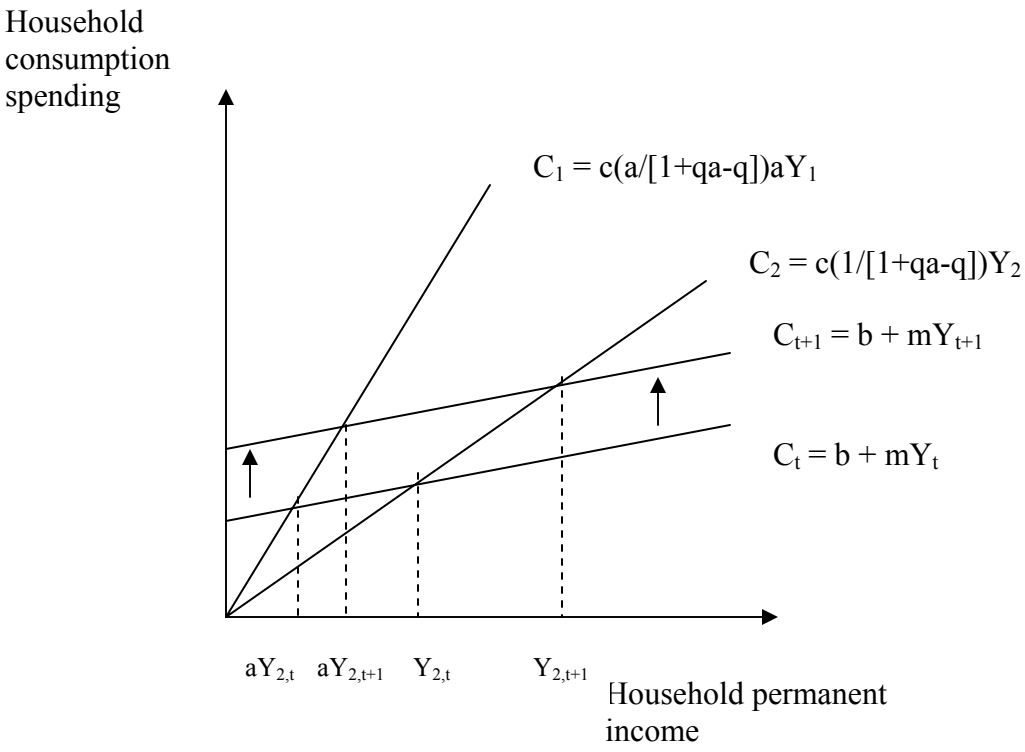

Figure 6. The effect of rising income on the cross-section consumption function in the PRI model.